HP Integrity Extensible Firmware Interface (EFI), Management Processor (MP) and Multi-Operating System (OS) Load lab

Integrity labs Session 3204

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Lab Objectives

After attending this four hour lab session, the attendee should;

- Be able to navigate the Management Processor (MP) menu and deploy the HP Integrity system onto a customer's management and enterprise LAN environment;

- Be familiar with the EFI environment as it is proliferating into x86 and PDA markets.

- Be able to use the OS independent utility environment.

- Demonstrate the steps necessary to load multiple operating systems or a single system (HP-UX, Windows, Linux, or OpenVMS) onto an HP Integrity server.

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Agenda

- Introduction to the Management Processor
- Overview of EFI
- Overview of firmware initialization
- User interfaces and system set up
- Specifics for loading (HP-UX, Linux, Windows or OVMS)

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Introduction to the Management Processor (MP)

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Management Processor (1 of 3)

- Textual user interface for system configuration and management
- Present on every Integrity server
  - Powered on if there is any AC power to the box
  - Management Processor similar to iLO and RILOE
- Accessible locally via RS232 or via its own LAN
  - IP must be set before remote access with LAN
- For remote access
  - Using HyperTerminal recommend
  - Telnet can be used with various warnings
- Management for the entire complex, not just a partition

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Management Processor (2 of 3)

- EFI Boot Manager and shell accessible for each partition via Management Processor
  - Enter *co* at the MP> prompt
  - Choose *partition (partitionable or cell based systems only)*
- Management Processor console can be displayed
  - Serial
  - LAN (dedicated network for Management Processor)
- Other tasks available
  - Complete system power down (except Management Processor)
  - Reset partitions
  - Examine FRU data
  - View partition/cell configuration data
  - Update revisions
  - Diagnostics and many more tasks

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Management Processor (3 of 3)

- Works with and through Baseboard Management Controller (BMC)
- Provides serial- and LAN-based console
- Provides remote low-level capabilities
  - System reset
  - System transfer of control
  - Remote soft (graceful) shutdown
  - Remote hard power off/on (48 volts is on if the AC plug is connected)
  - And more…

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Connecting to Management Processor

- RS-232
  - PC terminal emulation program
  - hpterm or vt100
  - 8bit/no parity/Xon-Xoff
  - Null modem cable LAN
  - Network
  - Use hub if available or multiple connections to network – otherwise crisscross cable
  - Use lc command to set IP parameters
  - If using a laptop, make it its own gateway

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Management Processor rx2600 main menu

```
Management Processor login:
Management Processor password:


              Hewlett-Packard Management Processor

  (c) Copyright Hewlett-Packard Company 1999-2002.  All Rights Reserved.

                   System Name: arizona-c


***************************************************************************
                    MP ACCESS IS NOT SECURE
  No MP users are currently configured and remote access is enabled.
          Set up a user with a password (see SO command)
                              OR
    Disable all types of remote access (see EL and ER commands)
***************************************************************************
```

New Management Processor firmware uses Admin/Admin and Oper/Oper default accounts

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Management Processor rx2600 entry screen

```
Management Processor password:



                    Hewlett-Packard Management Processor

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                         System Name: arizona-c



*****************************************************************************
                         MP ACCESS IS NOT SECURE
   No MP users are currently configured and remote access is enabled.
              Set up a user with a password (see SO command)
                                    OR
       Disable all types of remote access (see EL and ER commands)
*****************************************************************************


[Read only - use ^Ecf for console write access.]
```

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Management Processor rx2600 help menu

```
MP>

HE
==== MP Help =====================================================(Administrator)===
       Hardware Revision a0  Firmware Revision E.02.10 Oct  1 2002,15:53:45

                              MP Help System

   Enter a command at the help prompt:
           OVerview  : Launch the help overview
           LISt      : Show the list of MP commands
           <COMMAND> : Enter the command name for help on individual command
           TOPics    : Show all MP Help topics and commands
           HElp      : Display this screen
           Q         : Quit help
====
```

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Management Processor
rx2600 command list

```
MP HELP: li

==== MP Help ====================================================(Administrator)===
AC  : Alert display Configuration       MS  : Modem Status
BP  : Reset BMC Passwords               PC  : Remote Power Control
CA  : Configure asynch/serial ports     PG  : PaGing parameter setup
CL  : Console Log- view console history PR  : Power Restore Policy Config.
CG  : Certificate Generator             PS  : Power management module Status
CO  : COnsole- return to console mode   RS  : Reset System through RST signal
CSP : Connect to remote Service Proc.   SDM : Set event Display Mode
DC  : Default Configuration             SE  : SEssion- log into the system
DF  : Display FRU Information           SL  : Show event Logs
DI  : DIsconnect remote or LAN console  SO  : Security options & access control
EL  : Enable/disable LAN/WEB access     SR  : System firmware Revisions
ER  : Enable/disable Remote/modem       SS  : System Status of proc. modules
EX  : Exit MP and disconnect            TC  : Reset via Transfer of Control
HE  : Display HElp for menu or command  TE  : TEll- send a msg. to other users
IT  : Inactivity Timeout settings       VFP : Virtual Front Panel display
LC  : LAN configuration                 WHO : Display connected MP users
LOC : Locator LED control               XD  : Diagnostics and/or Reset of MP
LS  : LAN Status                        XU  : Upgrade the MP Firmware
MR  : Modem Reset
====
```

Management Processor
rx2600 power on/off command

```
MP Host Name:  arizona-c
MP> pc


PC

Current System Power State: On        Power Switch State: On
    ON  - Turn the power On
    OFF - Turn the power Off
    G   - Graceful shutdown

Enter your choice (ON/OFF/G) or [Q] to quit: _
```

Management Processor
rx2600 LAN connectivity command

```
MP> lc

LC

This command allows you to modify the LAN configuration.

Current configuration:
    MAC Address            : 0x00306e22b42d
    IP Address             : 15.99.85.62
    MP  Host Name          : arizona-c
    Subnet Mask            : 255.255.255.0
    Gateway                : 15.99.85.254
    Link State             : Auto Negotiate
    Web Console Port Number: 2023


Do you want to modify the LAN configuration? (Y/[N])
```

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Management Processor
rx2600 console command

```
MP> co

     CO

Leaving Management Processor Command Interface and entering Console mode.
Type Ctrl-B to reactivate the MP Command Interface.
```

```
Reactivating console.
Type Ctrl-B to access Management Processor Commands

[Read only - use ^Ecf for console write access.]
```

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EFI Training

Jason Reasor, David Soper & Dong Wei

EFI Module Objectives

- Provide an overview of EFI and how it fits in with the rest of the firmware
- Demonstrate the user interfaces EFI provides, concentrating on changes made by HP

Agenda

- Overview of EFI
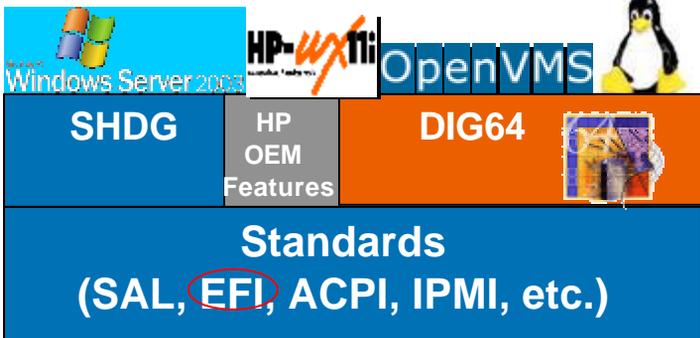- Overview of firmware initialization
- User interfaces

Terminology

- ACPI – Advanced Configuration and Power Interface
- DIG64 – Developer's Interface Guide for 64-bit Intel Architecture-based Servers (Dell, Fujitsu-Siemens, HP, Intel, IBM, NEC)
- EBC – EFI Byte Code
- EFI – Extensible Firmware Interface
- IPF – Itanium Processor Family
- PAL – Processor Abstraction Layer
- PDT – Page De-allocation Table
- SAL – System Abstraction Layer
- SHDG – Microsoft Server Hardware Design Guide

Itanium Platform Architecture (IPF)

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What is EFI?

- EFI (Extensible Firmware Interface) defines the OS/FW Boot Services and the Device Driver Model
  - Equivalent of HPPA's IODC, LIF, and ISL
  - Equivalent of legacy x86 BIOS INT calls and Option ROM
- Processor Architecture Agnostic
- Operating System Agnostic
- Specification Ownership
  - Currently Intel, HP was a major consultant
  - In the process of forming an industry forum

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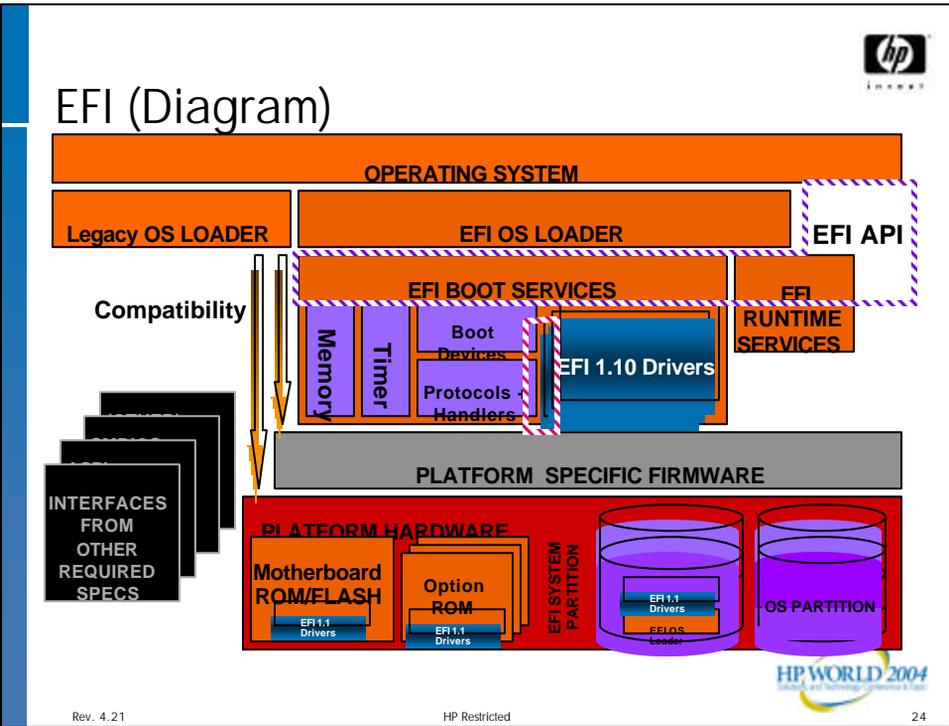
EFI User Interactions

- EFI User Interfaces
  - Menu-drive TUI (Optional)
  - Command line interface
    - Default EFI Shell from Intel Sample Implementation
    - Vendor-specific shell enhancements (e.g., HP POSSE)
  - Boot Manager
    - Default Boot Manager from Intel Sample Implementation
    - Vendor enhancements
    - Includes OS boot menu
- EFI Disk Partitions and File System

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EFI (Diagram)

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OPERATING SYSTEM

Legacy OS LOADER | **EFI OS LOADER** | **EFI API**

Compatibility

EFI BOOT SERVICES | **EFI RUNTIME SERVICES**

Memory | Timer | **Boot Devices** | **EFI 1.10 Drivers**

Protocols Handlers

INTERFACES FROM OTHER REQUIRED SPECS

PLATFORM SPECIFIC FIRMWARE

PLATFORM HARDWARE

Motherboard ROM/FLASH
EFI 1.1 Drivers

Option ROM
EFI 1.1 Drivers

EFI SYSTEM PARTITION
EFI 1.1 Drivers
EFI OS Loader

OS PARTITION

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EFI-related Partitions

- HP Support
  - One EFI System Partition (ESP)
  - One HP Service Partition (HPSP)
  - For customers who do not order preinstalled OS, they will receive a system with no or blank disks and a Diagnostic CD. For those products that provide a recovery CD, the EFI related partitions will be restored to factory default.
- What Goes Where?
  - If it is essential for boot, it must be in ESP
  - If it is useful to all OSes, that's a hint that ESP might be right place
  - Directory hierarchy on ESP should allow OS to add content to a unique directory. The OSes should put stuff in "their own directory(s)"
- CD/DVD
  - EFI interprets the "no emulation" image as an ESP. All the above mentioned EFI drivers, tools and utilities can all be in the ESP. There is no need for an HPSP on CD/DVD.

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ESP/HPSP Directory Structure

ESP
  \EFI\HP\EFIDriver
  \EFI\HPUX
  \EFI\Redhat
  \EFI\debian
  \EFI\suse
  \EFI\Microsoft
  \EFI\MSUtil
  \EFI\BOOT
  \EFI\Intel Firmware - FPSWA spec specified, Linux uses this to check fpswa.efi
  \EFI\Intel_Firmware - HP-UX currently check for fpswa.efi

  \EFI\VMS
(Online registry at http://www.dig64.org/OnLine_Registries/ESP_Registry)
HPSP
  \EFI\HP\DIAG
  \EFI\HP\TOOLS

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Heritages

Windows		OS		HP-UX/MPE
BIOS/x86 OpRom	→	EFI/EFI Driver (IPF PAL/SAL)	←	PDC/IODC
IA-32 HW		HW		PA HW

Foundation for MultiOS and Legacy Free Support

Differences from PA-RISC

WAS	IS
BCH / ISL	Boot manager / shell
Proprietary	Open
IODC	EFI driver
Bootp	PXE
Boot path	EFI device path

EFI Benefits

- High Level Code
- Easier to debug, maintain & validate
- Easier to get skill set

- No Collision
- No Space Limitation
- Support Speedy Boot
- Provide some drivers to OS

EFI Apps	EFI Drivers
EFI	
IA-32	IPF	Others

- Portable
- Fully Realized Flexibility

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Integrity Firmware Initialization

- Integrity Firmware initialization is comprised of three major code paths:
  - PAL – provided by Intel, low level cpu initialization
  - SAL – provided by the platform vendor, platform initialization
  - PAL/SAL are IPF-specific
  - EFI – based on Intel Sample Implementation, modified by HP
  - Completely PC-AT Legacy Free (no BIOS support)
  - EFI is the last code executed in the firmware initialization path

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Integrity Firmware Initialization – EFI

- IPMI FPL and SEL events are generated
- Consoles are connected
  - First time console input is available
- I/O drivers loaded (embedded and PCI option ROMs)
  - IPF Native EFI Drivers
  - EBC Drivers
- Devices behind the cards that were initialized are enumerated
- The Boot Manager is launched
- If autoboot is enabled, and a valid boot path exists, the system will attempt to boot

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Firmware Architecture

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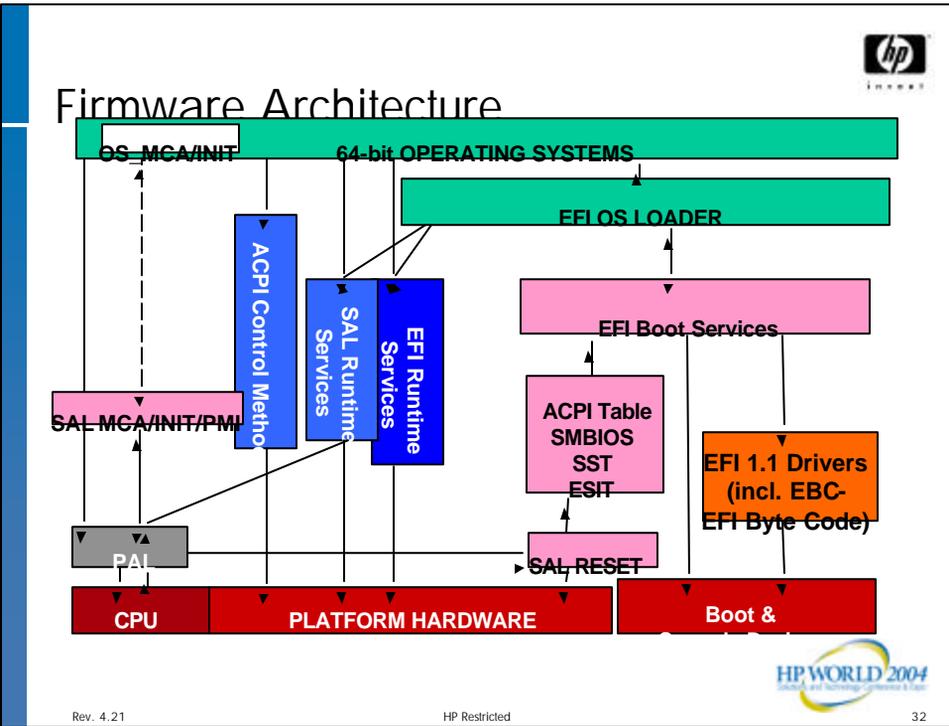
User Interfaces

- After the system is initialized, EFI provides the interfaces with which the user interacts
  - Boot Manager
    - Menu based interaction
  - EFI Shell
    - Command line interface
- The user can move back and forth between the two interfaces

EFI Boot Manager

- Menu based interface
- Arrow keys used to traverse menus
- Used primarily for options related to booting an OS or loading an EFI application
  - Select boot option maintenance menu from main menu
  - Set boot path
    - Usually not needed
    - Done by operating system installation
  - Change order of items in boot menu
    - Uppermost is default boot
    - Useful if multiple operating systems are installed
  - Set or change the console input, output, and error devices

EFI Boot Manager (Cont.)

- First level menu: Boot Manager Menu
  - Displays boot options
  - Entrypoint for EFI shell
  - Boot maintenance menu
  - Autoboot timeout
    - time period before boot option list is traversed

EFI Boot Manager — Main menu

```
Main Menu. Select an Operation


        Boot from a File
        Add a Boot Option
        Delete Boot Option(s)
        Change Boot Order

        Manage BootNext setting
        Set Auto Boot TimeOut

        Select Active Console Output Devices
        Select Active Console Input Devices
        Select Active Standard Error Devices

        Cold Reset
        Exit
```

EFI Boot Manager (Cont.)

• Second level menu: Boot Maintenance Menu
- Configure boot options
- Select console devices
- Reset
- Exit back to primary boot manager menu

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EFI Boot Manager (Cont.)

• Boot Maintenance Menu: Boot Options
- Boot from a file
- Add boot options
- Delete boot options
- Change boot order
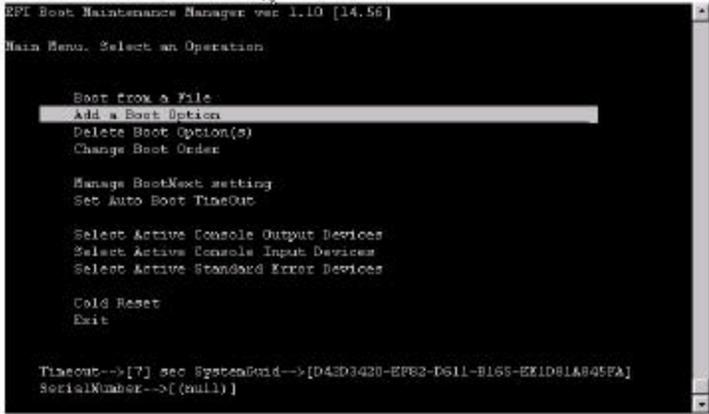- Manage "BootNext" setting
- Set auto boot time out

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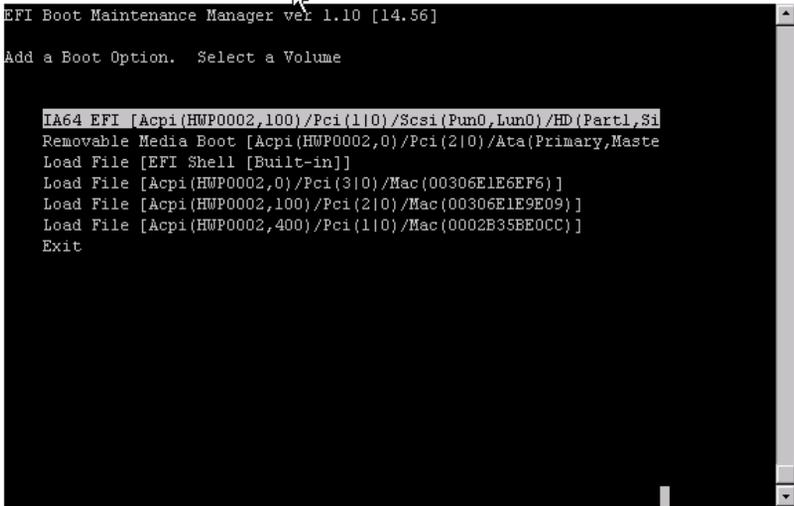
EFI Boot Manager — Adding a boot option


```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Main Menu. Select an Operation

        Boot from a File
        Add a Boot Option
        Delete Boot Option(s)
        Change Boot Order

        Manage BootNext setting
        Set Auto Boot TimeOut

        Select Active Console Output Devices
        Select Active Console Input Devices
        Select Active Standard Error Devices

        Cold Reset
        Exit


    Timeout-->[7] sec SystemGuid-->[D43D3420-EF82-D611-B165-EE1D81A845FA]
    SerialNumber-->[(null)]
```

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EFI Boot Manager — Selecting boot disk


```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Add a Boot Option.   Select a Volume

    IA64 EFI [Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)/HD(Part1,Si
    Removable Media Boot [Acpi(HWP0002,0)/Pci(2|0)/Ata(Primary,Maste
    Load File [EFI Shell [Built-in]]
    Load File [Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E1E6EF6)]
    Load File [Acpi(HWP0002,100)/Pci(2|0)/Mac(00306E1E9E09)]
    Load File [Acpi(HWP0002,400)/Pci(1|0)/Mac(0002B35BE0CC)]
    Exit
```

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EFI Boot Manager — Traversing to boot file

```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Select file or change to new directory:

    05/23/02  04:28p <DIR>          512 EFI
    06/18/02  03:27p        9,775,616 fweupdate.xpkl_0.b020.efi
    [Treat like Removable Media Boot]
    Exit
```

- Highlight the required directory and press *Enter*
- Continue until you get to the \EFI\HPUX directory

EFI Boot Manager — Selecting boot file

```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Select file or change to new directory:

    05/23/02  04:28p <DIR>          512 .
    05/23/02  04:28p <DIR>          512 ..
    05/23/02  04:45p        417,399 HPUX.EFI
    05/23/02  04:45p         24,576 NBP.EFI
    Exit
```

- At the required directory, highlight the desired boot file (HPUX.EFI in this case)
- Press *Enter*

EFI Boot Manager — Entering description

```
     Filename: \EFI\HPUX\HPUX.EFI
 DevicePath: [Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)/HD(Part1,SigFA8B0000)/
\EFI\HPUX\HPUX.EFI]
     IA-64 EFI Application 05/23/02  04:45p     417,399 bytes


  Enter New Description:  Boot HP-UX fom Disc 0
  New BootOption Data. ASCII/Unicode strings only, with max of 240 characters
  Enter BootOption Data Type [A-Ascii U-Unicode N-No BootOption] :  Ascii
  Enter BootOption Data [Data will be stored as Ascii string]:
Boot HP-UX from Disc 0



  Save changes to NVRAM [Y-Yes N-No]:
```

- Enter the boot entry menu line, the type of data (ASCII or Unicode), and the description
- Save to NVRAM

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EFI Boot Manager — Exit add boot option

```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Add a Boot Option.  Select a Volume


  IA64_EFI [Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)/HD(Part1,Si
  Removable Media Boot [Acpi(HWP0002,0)/Pci(2|0)/Ata(Primary,Maste
  Load File [EFI Shell [Built-in]]
  Load File [Acpi(HWP0002,0)/Pci(3|0)/Mac(00306E1E6EF6)]
  Load File [Acpi(HWP0002,100)/Pci(2|0)/Mac(00306E1E9E09)]
  Load File [Acpi(HWP0002,400)/Pci(1|0)/Mac(0002B35BE0CC)]
  Exit
```

- Move down to the Exit line and press *Enter*

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EFI Boot Manager — Exit boot maintenance

```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Main Menu. Select an Operation

        Boot from a File
        Add a Boot Option
        Delete Boot Option(s)
        Change Boot Order

        Manage BootNext setting
        Set Auto Boot TimeOut

        Select Active Console Output Devices
        Select Active Console Input Devices
        Select Active Standard Error Devices

        Cold Reset
        Exit


Timeout-->[7] sec SystemGuid-->[D42D3420-EF82-D611-B165-EE1D81A845FA]
SerialNumber-->[(null)]
```

- Move down to the Exit line and press *Enter*

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EFI Boot Manager — Add new boot entry

```
EFI Boot Manager ver 1.10 [14.56]  Firmware ver 80.10 [4216]

Please select a boot option

    EFI Shell [Built-in]
    Boot HP-UX fom Disc 0
    Boot option maintenance menu
    Security/Password Menu


    Use   and  to change option(s). Use Enter to select an option
```

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EFI Boot Manager — Change boot order


```
EFI Boot Maintenance Manager ver 1.10 [14.56]

Main Menu. Select an Operation


        Boot from a File
        Add a Boot Option
        Delete Boot Option(s)
        Change Boot Order

        Manage BootNext setting
        Set Auto Boot TimeOut

        Select Active Console Output Devices
        Select Active Console Input Devices
        Select Active Standard Error Devices

        Cold Reset
        Exit


Timeout-->[7] sec SystemGuid-->[D42D3G2D-EF8Z-D611-B163-MX1D61A6437A]
SerialNumber-->[(null)]
```

- Go to the Boot maintenance menu
- Select *Change Boot Order*

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EFI boot option menu


```
EFI Boot Manager ver 1.10 [14.60]  Firmware ver 1.82 [4306]

Please select a boot option

    EFI Shell [Built-in]
    Boot option maintenance menu
    Security/Password Menu


    Use ^ and v to change option(s). Use Enter to select an option
Loading.: EFI Shell [Built-in]
EFI Shell version 1.10 [14.60]
_
```

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EFI Boot Manager (Cont.)

- Boot Maintenance Menu: Select Console Devices
  - Select active console output devices
  - Select active console input devices
  - Select active console error devices

- Multiple console devices can be selected

- It is possible, though not recommended, to select a serial console as input-only or output-only

- For serial consoles, PC-ANSI, VT-100, VT-100+, and VT-UTF8 emulation modes are supported.

- Changes take effect next boot.

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Management Processor console selection

```
Select the Console Output Device(s)


   Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(PcAnsi)
   Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100)
 * Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(Vt100+)
   Acpi(PNP0501,0)/Uart(9600 N81)/VenMsg(VtUtf8)
   Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(PcAnsi)
   Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100)
 * Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(Vt100+)
   Acpi(HWP0002,700)/Pci(1|1)/Uart(9600 N81)/VenMsg(VtUtf8)
 * Acpi(HWP0002,700)/Pci(2|0)
Save Settings to NVRAM
Exit
```

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EFI Shell

- Command line interface
- Not UNIX, not DOS
- Provides a platform for a user to:
  - Get information on the system
  - Boot an OS
  - Install an OS
  - Execute batch scripts
  - Launch EFI applications
  - Load EFI drivers
  - Manage files and system variables

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EFI Shell (Cont.)

- Shell invocation
  - Automatically execute the "startup.nsh" file if it exists
  - Wait for command input from console
- EFI commands
  - See references section for more information and user guides

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EFI Shell (Cont.)

• File systems
  - EFI understands FAT filesystems
  - All disk partitions (FAT or not) will be displayed as "blkX" devices
  - FAT partitions will be displayed as "fsX" devices
  - A user can traverse "fsX" file systems just like he would traverse a filesystem under UNIX or DOS
  - File systems can be seen from the shell by issuing the "map" command

EFI Shell (Cont.)

• Most frequently used commands
  - help
  - map
  - cd
  - dir
  - copy
  - edit
  - type
  - load
  - reset (resets the system)

EFI Applications

- Compiled to run in the EFI environment
  - Intel provides an EFI Application Toolkit
- Named using the ".efi" extension
- Example: "ifconfig.efi"
- To execute the application enter the name without the .efi extension as well as any parameters the application requires
- OS loaders
  - HP-UX: hpux.efi
  - VMS: vms_loader.efi
  - Windows: ia64ldr.efi
  - Linux: elilo.efi

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EFI Drivers

- Compiled to load in the EFI environment
  - Intel provides the EFI Sample Implementation that can be used for driver development
- Named using the ".efi" extension
- Example: "tcpipv4.efi"
- To load the driver, use the "load" command and the driver name

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EFI Drivers

- PCI card drivers (native/EBC) are located on the card
- At boot EFI will load and connect:
  - (rx5760 and below) drivers on all PCI cards
  - (rx7620 and above) drivers on cards connected to the core cell or have boot paths associated with them
- If a card does not have an EFI driver, the devices attached to the card can not be used from the EFI shell
  - Can still be functional at the OS level if OS driver is provided
- EFI drivers have nothing to do with OS drivers
  - If a card has no EFI driver, the OS can still use it

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Scripts

- Batch scripts
  - text file containing a sequence of commands and / or comments
  - named using the ".nsh" extension
  - can execute shell commands and EFI applications
  - comments begin with #
  - example: netsetup.nsh

```
cd \efi\tools
load tcpipv4.efi
# set the ip address for the machine "go_hp"
ifconfig sni0 inet 15.99.80.20 netmask 255.255.255.0
route add default 15.99.80.254
cd \
```

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POSSE – Background

- Pre-OS System Environment

- Common firmware user interface for all HP manufactured Integrity servers

- EFI shell from Intel used as a base

- Integrate PA-RISC firmware interface functionality into the IPF environment

- Designed and implemented across several HP labs

POSSE – Background

- Designed to make the EFI shell code common across all HP servers

- There are different firmware bases within HP, so POSSE provides an abstraction layer to the commands so they can gather the appropriate information from the core firmware

POSSE – Commands

_hp_

- HP enhancements to "help" command
  - Command categories (HP enhanced "help" command)
    - boot – boot related commands
    - configuration – retrieving and updating system information
    - device – device, driver, and handle related commands
    - filesystem – filesystem related commands
    - memory – memory related commands
    - shell – basic shell navigation and customization
    - scripts – EFI shell script commands
  - Information on POSSE replacements for PA-RISC BCH commands ("help bch")

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POSSE – Help Command

_hp_

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POSSE – Help Command

```
--------------------------------
The BCH functionality previously provided by the FRU command is
not available from the EFI Shell.

To obtain FRU information use the Guardian Service Processor (GSP)
command "df".

End of FRU help
--------------------------------

fs0:\efi\HP\FIRMWARE> help bch pr
PR help information
--------------------------------
The BCH functionality previously provided by the PRocessor command is
now available with the "info cpu" command.

For more information on the "info cpu" EFI command, at the shell
prompt type:

   help info

End of PR help
--------------------------------

fs0:\efi\HP\FIRMWARE>
```

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POSSE – Boot Commands

- autoboot – view or set autoboot timeout variable

- bcfg – displays/modifies the driver/boot configuration

- boottest – view or set speedyboot bits

- lanboot – boot over the LAN

- reset – reset the system

- tftp – trivial file transfer protocol

Blue text indicates HP value-add shell commands.

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POSSE – Configuration Commands

- cpuconfig – deconfigure or reconfigure cpus
- date – displays or set the date
- dimmconfig* – deconfigure or reconfigure DIMMs
- err – displays or changes the error level
- errdump – view or clear logs
- fru* – view fru data
- info – display hardware information
- monarch – view or set a monarch processor

* Available on rx7620 and above

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POSSE – Configuration Commands

- palproc – make a PAL call
- rootcell* – view of set the root cell
- salproc – make a SAL call
- search* – connect drivers on a cell or PCI slot
- time – display or set the time
- ver – display the version information (superseded by "info fw")
- verbose – configures system boot output details

* Available on rx7620 and above.

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POSSE – Info Commands

- info sys – display system information
- info cpu – display cpu information
- info mem – display memory information
- info io – display io information
- info chiprev – display ASIC revisions
- info fw – display firmware revision information
- info boot – display boot information
- info warning – displays warnings

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POSSE – Device Commands

- baud – sets serial port baud rate
- connect – binds a driver to a device
- dblk – hex dump of block devices
- devices – display devices managed by EFI drivers
- devtree – display tree of devices
- dh – dump handle info
- disconnect – disconnects driver from device

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POSSE – Device Commands

- drivers – display list of drivers
- drvcfg – invoke the driver config protocol
- drvdiag – invokes the driver diagnostics protocol
- guid – dump known GUIDs
- lanaddress – display core io MAC address
- load – load EFI driver
- loadpcirom – load PCI option ROM image into memory

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POSSE – Device Commands

- map – map short name to device path
- openinfo – display the open protocols for given handle
- pci – display PCI devices or PCI configuration space
- reconnect – reconnects driver to a device
- unload – unload a protocol image

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POSSE – Filesystem Commands

- attrib – display or change the attributes of files or directories

- cd – updates the current directory

- comp – compares the contents of two files

- cp – copies one or more files/directories to another location

- eficompress – compress infile and write to outfile

- efidecompress – decompress infile and write to outfile

- ls – display a list of files and subdirectories

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POSSE – Filesystem Commands

- mkdir – creates directory

- mount – mount a filesystem on a block device

- rm – delete one or more files or directories

- setsize – set the size of a file

- touch – update time of file or directory with current time

- type – display the contents of a file

- vol – displays volume information of the file system

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POSSE – Memory Commands

- default – set the default nvram values
- dmem – dump memory or memory mapped I/O
- dmpstore – display all EFI variables
- memmap – display the memory map
- mm – memory modify
- pdt – view or clear pdt

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POSSE – Shell Commands

- alias – view or edit alias settings
- cls – clear the screen
- exit – exit EFI shell
- getmtc – display current monotonic counter value
- help or ? – displays help
- set – set or get environment variable
- xchar – enable/disable extended character features

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POSSE – Script Commands

- echo – echo text to stdout or toggle script echo
- else – script-only: use with IF THEN
- endfor – script-only: delimiter for FOR loop construct
- endif – script-only: delimiter for IF THEN construct
- for – script-only: loop construct
- goto – script-only: jump to label location in script
- if – script-only: IF THEN construct
- input – take user input, place in efi variable
- pause – script-only: prompt to quit or continue
- stall – stall the processor for some microseconds

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Console Selection

- Though firmware supports multiple active console devices, typically only one console is supported by the O/S.
- For HP-UX, only one console device should be selected, otherwise failures could occur.
- On rx5670 and below, the MP console always will be active (in addition to the selected consoles) during firmware boot regardless of console selection setting.
- Work is in progress to improve the situation in this area
  - DIG64 has defined a Primary Console concept
  - Improved user interface is being designed

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Identifying EFI Device Paths

- To identify which PCI slot corresponds to an EFI device path, use the POSSE "info io" command
- EFI device path almost always starts from the PCI Root Bridge (aka. LBA)
  - Identified with ACPI(_HID,_CID,_UID)
    - _HID can be HWP0002, HPQ0001, HPQ0002, etc.
    - _CID can be PNP0A03 or PNP0A08
    - _CID is not implemented in current Integrity systems
    - Non-HP systems usually have PNP0A03 in the _HID
  - EFI device path then continues with PCI(Dev/Func), SCSI(PUN#,LUN#), etc.
- EFI device path is equivalent to HP-UX Hardware Path
  - It is OS agnostic

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rx5670 core device paths

- MP console (0/0/1): `Acpi(HWP0002,0)/Pci(1|1)`
- A6869A VGA (0/0/4):   `Acpi(HWP0002,0)/Pci(4|0)/Pci(5|0)`
- Internal Disk A (0/0/2/0.0.0, c0t0d0):
  `Acpi(HWP0002,0)/Pci(2|0)/Scsi(Pun0,Lun0)`
- Internal Disk B (0/0/2/0.2.0, c0t2d0):
  `Acpi(HWP0002,0)/Pci(2|0)/Scsi(Pun2,Lun0)`
- Internal Disk C (0/1/1/0/1/1.0.0, c3t0d0):
  `Acpi(HWP0002,100)/Pci(1|0)/Pci(1|1)/Scsi(Pun0,Lun0)`
- Internal Disk D (0/1/1/0/1/1.2.0, c3t2d0):
  `Acpi(HWP0002,100)/Pci(1|0)/Pci(1|1)/Scsi(Pun2,Lun0)`
- Int. DVD-ROM (0/0/2/1.2.0):`Acpi(HWP0002,0)/Pci(2|1)/Scsi(Pun2,Lun0)`
- Internal DAT (0/0/2/1.0.0): `Acpi(HWP0002,0)/Pci(2|1)/Scsi(Pun0,Lun0)`
- External SCSI (0/1/1/0/1/0.x):
  `Acpi(HWP0002,100)/Pci(1|0)/Pci(1|0)/Scsi(…)`
- LAN (0/1/1/0/4/0):
  `Acpi(HWP0002,100)/Pci(1|0)/Pci(4|0)/Mac(…)`

Orange Color shows the HP-UX Hardware Path, Blue Color shows the HP-UX device file name

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More Device Path Examples

- ## Rx4640 core device paths
  - MP console: `Acpi(HWP0002,0)/Pci(1|1)`
  - Built-in VGA: `Acpi(HWP0002,0)/Pci(4|0)`
  - Internal Disk 0:   `Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)`
  - Internal Disk 1:   `Acpi(HWP0002,100)/Pci(1|1)/Scsi(Pun1,Lun0)`
  - Int. DVD-ROM:
    `Acpi(HWP0002,0)/Pci(3|0)/Ata(Primary,Master)`
  - LAN: `Acpi(HWP0002,100)/Pci(2|0)/Mac(…)`

- ## Rx2600 core device paths
  - MP console: `Acpi(HWP0002,700)/Pci(1|1)`
  - SERIAL A: `Acpi(PNP0501,0)`
  - Built-in VGA: `Acpi(HWP0002,700)/Pci(2|0)`
  - Internal Disk 0:   `Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun0,Lun0)`
  - Internal Disk 1:   `Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun1,Lun0)`
  - Internal Disk 2:   `Acpi(HWP0002,100)/Pci(1|0)/Scsi(Pun2,Lun0)`
  - Int. DVD-ROM:
    `Acpi(HWP0002,0)/Pci(2|0)/Ata(Primary,Master)`
  - LAN 10/100 `Acpi(HWP0002,0)/Pci(3|0)/Mac(…)`
  - LAN Gb: `Acpi(HWP0002,100)/Pci(2|0)/Mac(…)`

References

- ## EFI Website
  - http://developer.intel.com/technology/efi/efi.htm
- ## ACPI Website
  - http://www.acpi.info
- ## DIG64 Website
  - http://www.dig64.org

Multi-OS Installation

HP Integrity Labs

OS installation overview

- Disk preparation overview
- HP-UX installation overview
- Windows 2003 installation overview
  - Integrity Essentials
  - EFI Based Setup Utility
  - SAC
  - RDC
  - Partitions
- Red Hat installation overview
  - Text console
  - Linux Enablement Kit
  - Partitions
- Open VMS installation overview
- Lab time

Multi-operating system installation steps

- Step 1 — Creating GUID partition table disks
- Step 2 — Removing all boot options
- Step 3a — Installing Windows on drive (drive x)
- Step 3b — Installing Linux 64 on same drive as Windows
- Step 3c — Installing HP-UX on drive y
- Step 3d — Installing Open VMS on drive z
- Step 4 — Modifying boot options as necessary

Step 1 — New disk tools for GUID partition table

- Diskpart.efi ?   Creates EFI GUID partition table system partition
- Chkdsk.efi ?   Checks EFI GUID partition table for correctness
- Format.efi ?   Formats GUID partition table system partition or standard FAT formats

EFI ?   Operating system disk layout

- Three main parts
  - EFI firmware core (APIs)
  - User interface ?   Boot Manager and shell
  - EFI disk (boot) partition and file system in FAT format

LBA0   LBA1   LBAn

| M B R | EFI Partition Table Header | 1 | 2 | System Partition (EFI format) | OS partition (contains root disk) (HFS or VxFS) | 1 | 2 | EFI Partition Table Header |

Backup Partition Table
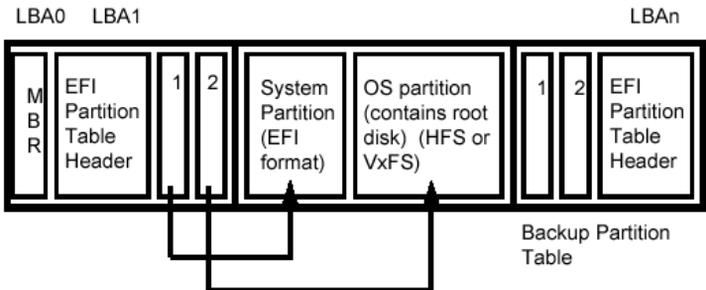
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Step 2 — Removing boot options

  - Select *Boot Option Maintenance*
  - Select *Delete Options*
  - Delete all soft boot options

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Step 4 — Modifying boot options

- Stop at EFI shell option
- Review and verify boot options
- Boot and shut down all three operating systems
- Modify boot option order as desired

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Windows Installation

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Successful Windows installation on Itanium processor family servers

- Read all documentation
- Locate the ProLiant Essentials Foundation Pack and use
  - Poster
  - Documentation
  - Drivers
  - Utilities
- Locate any and all printed errata and pay close attention to these documents
- Use current tested drivers and firmware as provided on Smart Setup and at www.hp.com/support/itaniumservers
- Use HP supported cards with tested/released firmware
- Educate customers on the importance of running in supported configurations

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Installation overview for Microsoft Windows 2003 Server 64-bit

- Installation using standard Windows 2003 Server CD (requires a product key)
- Partitioning of a GUID partition table disk
- Windows installation process from Special Administration Console

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HP Integrity Essentials Foundation Pack for Windows

- For customers who provide their own Windows operating system
  - EFI Based Setup Utility
    - Menu driven utility to assist in server setup for operating system install
  - Smart Setup
    - Software and drivers for HP accessories
    - Configuration utilities for HP accessories
    - HP server agents
    - Documentation
      - Windows on Integrity FAQ
      - Windows on Integrity installation manual
      - Manuals and documentation for HP accessories and utilities
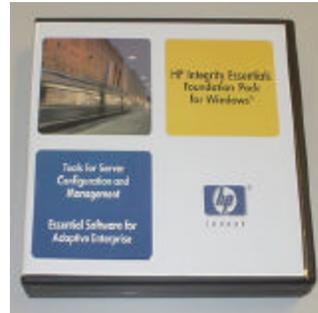
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High-level install flow for local install (1 of 2)

- Read and understand documentation
- Verify firmware versions of system and accessories are current – www.hp.com/support/itaniumservers
- If working on a cell-based system, configure partitions
  - When using Superdome, use SMS (IA-32) PC to create these using ParCLI
  - When using rx8620 or rx7620 use a management console PC (IA-32) to run Partition Wizard first and ParCLI if needed
    - Note these tools do not run on IA-64 Windows
- Boot your server to Smart Setup and use EFI Based Setup Utility if not using reinstallation media
- Complete Windows installation

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High-level install flow for local install (2 of 2)

- Use Smart Setup to install necessary drivers and utilities
- Use Microsoft tools to verify current patches have been applied
- Sign up for proactive notification of updates at www.hp.com/support/itaniumservers
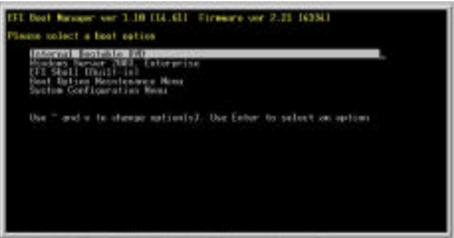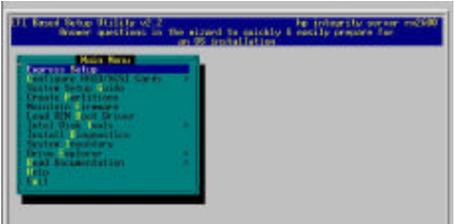
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EFI Based Setup Utility

- When do I use EFI Based Setup Utility?
  - Only when doing an manual installation
  - When your system is not pre-loaded with Windows

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# Windows partitioning configuration

- Standard installation will require minimum of three partitions
  - EFI System Partition
    - HP Service Partition optional
  - Microsoft Reserved Partition
  - Standard partition for the operating system and data
- If no EFI System Partition exists, the installation will ask if you want to create one
- MSR is automatically created if it does not exist
- Remainder of the drive can be partitioned and formatted by user
- Consider saving space for Linux install

Smart setup — Driver installation after operating system installation
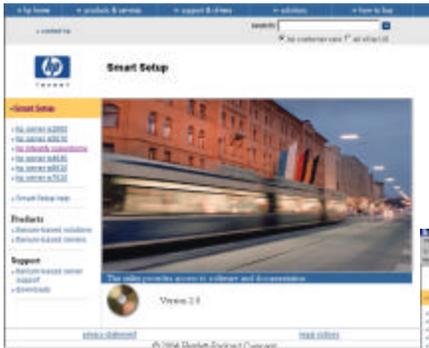
Windows Special Administration Console

- Special Administration Console, new for Windows 2003
  - Provides a serial console, critical for headless installation
  - Shutdown, set an IP address, crashdump, kill a process
  - Spawn a command prompt; then run almost any Windows console application
  - Multiple channels to SAC can be active at once
  - On Integrity Servers, the Management Processor virtualizes a UART
    - If you can get to the Management Processor, you can get to the SAC of any Windows partition via this UART
  - Typical use
    - Use Management Processor to get to the SAC for desired partition
    - From SAC, configure server IP and terminal services
    - Use TS to have full remote GUI access to Windows partition

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Special Administration Console (1 of 2)

```
Computer is booting, SAC started and initialized.

Use the "ch -?" command for information about using channel
Use the "?" command for general help.


SAC>
```

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Special Administration Console (2 of 2)

```
SAC>cmd
The Command Prompt session was successfully launched.
SAC>
```

Special Administration Console
help menu (1 of 3)

```
SAC>help
ch                           Channel management commands.  Use ch -
cmd                          Create a Command Prompt channel.
d                            Dump the current kernel log.
f                            Toggle detailed or abbreviated tlist i
? or help                    Display this list.
i                            List all IP network numbers and their
i <#> <ip> <subnet> <gateway> Set IP addr., subnet and gate
id                           Display the computer identification in
k <pid>                      Kill the given process.
l <pid>                      Lower the priority of a process to the
lock                         Lock access to Command Prompt channels
m <pid> <MB-allow>           Limit the memory usage of a process to
p                            Toggle paging the display.
r <pid>                      Raise the priority of a process by one
s                            Display the current time and date (24
s mm/dd/yyyy hh:mm           Set the current time and date (24 hour
t                            Tlist.
restart                      Restart the system immediately.
shutdown                     Shutdown the system immediately.
crashdump                    Crash the system. You must have crash
SAC>i 2 15.99.85.107 255.255.255.0 15.99.85.254_
```

Special Administration Console help menu (2 of 3)

```
SAC>cmd
The Command Prompt session was successfully launched.
SAC>
EVENT:   A new channel has been created.  Use "ch -?" for channel help.
Channel: Cmd0001
SAC>ch -si 1_
```

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Special Administration Console help menu (3 of 3)

```
SAC>
     i
Net: 2, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 3, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 4, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 5, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 6, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
SAC>i 2 15.99.85.107 255.255.255.0 15.99.85.254
SAC successfully set the IP Address, subnet mask, and gatew
SAC>i
Net: 2, Ip=15.99.85.107  Subnet=255.255.255.0  Gateway=15.9
Net: 3, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 4, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 5, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
Net: 6, Ip=0.0.0.0  Subnet=0.0.0.0  Gateway=0.0.0.0
SAC>
```
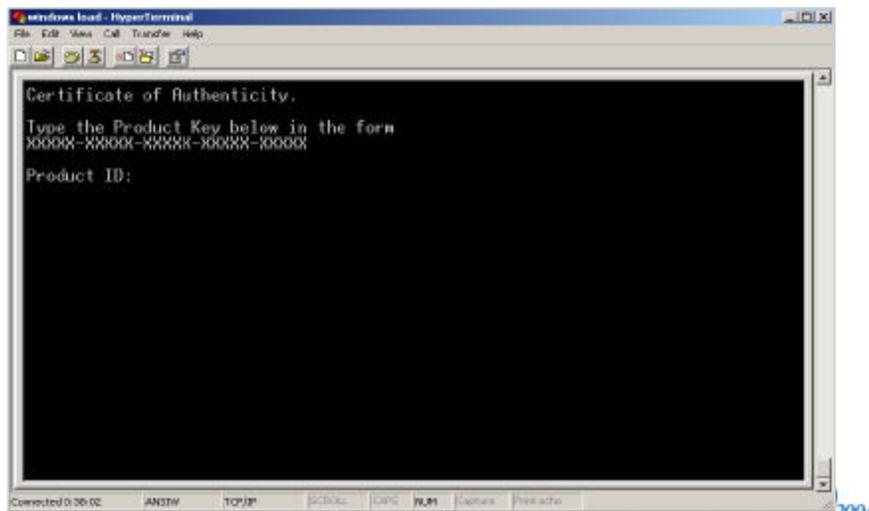
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Product key installation
using the Special Administration Console

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Remote Desktop Administration (1 of 2)

- Server side
  - At the SAC> prompt, enter `ch –sn cmd0001` or `ch –si 1` to open channel 1 for use
  - Press any key to view channel 1 (cmd0001)
  - When the User Name option displays, enter *Administrator*
  - When the Domain option displays, press *Enter*
  - When the Password option displays, enter the administrator password of the operating system
  - At the C:\>Windows\Systems32 prompt, enter
    - reg add "HKLM\System\CurrentControlSet\Control\Terminal Server" /v fDenyTSConnections /t REG_DWORD /d 0 /f
  - Press *Enter*
    - ***The operation completed successfully***

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Remote Desktop Administration (2 of 2)

• Client side
  - *Start ® Programs ® Accessories ® Communications ® Remote Desktop Connection*

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Console configurations

  - Default for Itanium 2 is VGA
    • Add console=ttyS0 to boot line for serial console on rx2600
    • Console device may vary depending on system and port used
  - Video console can be set up with add-on graphics card or Extended Core I/O card
  - Console paths are enabled and disabled in EFI
  - X is supported on the graphics console

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Installation considerations

- Start with a clean disk (or Windows installation first)
- Use diskpart to clean the drive if necessary
  - EFI (FAT) partition (100-300MB)
  - Swap partition (~2 x memory)
  - Ext2 (or other) Linux file system partition (>3GB)
  - Useful to place some other file systems on separate volumes:
    /opt, /usr, /home, /tmp
- VGA is easier than serial console emulation

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Linux Installation

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HP Enablement Kit for Linux (1 of 3)

- Installation, configuration, and recovery media
  - Contains a booklet with references to software
  - Contains release notes
  - Visit hp.com for updates
- Linux I/O drivers DVD
  - Booklet with I/O drivers and installation instructions
  - References software.hp.com for updates
- Installation and configuration assistance of the Linux operating environment for the first 90 days after purchase

HP Enablement Kit for Linux (2 of 3)

- Why use it?
  - Sets up Linux servers in a consistent and reliable way
  - Deploys multiple Linux servers quickly and easily
- What does it do?
  - Facilitates the installation, recovery, and management of a Linux distribution on an HP Integrity server

HP Enablement Kit for Linux (3 of 3)

- Key functions include:
  - Installation of a Linux distribution
  - Hardware discovery
  - Disk partitioning
  - Configuration of storage controllers
  - Recovery of a factory-installed Linux
  - Includes Systemimager
    - Automates installation of Linux to large numbers of similar servers
    - Automates software distribution, content distribution, and operating system updates
    - Maintain custom loads and automatically installs new servers to match the configuration

Serial console (1 of 2)

- Anaconda
  - The Red Hat Linux installer
  - Can be invoked in character mode for a serial console (VT100+) when elilo is started from EFI
    - fs1> elilo linux text console=ttyS0
  - Use up and down arrow keys to move within a selection group
  - Use Tab key to move between groups or between buttons
  - If there is only one set of selections, pressing the Enter key will invoke the default button directly from the selection

Serial console (2 of 2)

```
fs0:\> elilo

ELILO boot:
Uncompressing Linux... !
ELILO boot: linux console=ttyS0
```

HP-UX Installation

HP Integrity Labs

Console configurations for HP-UX 11i v2.0

- Default for Itanium 2 installation is serial console
- Video console can be set up with add-on graphics card or Extended Core I/O card
- Console paths are enabled and disabled in EFI
- Both types of consoles can be active in parallel
- X and CDE are supported on the console

OVMS Installation

HP Integrity Labs

Console configurations for OVMS

- Only one console can be active
- Standard OVMS installed file system and structure
- Same familiar OVMS management tools

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