Operating System Installation

Chapter Objectives

- Explore the hardware and software prerequisites for OS installation.

- Explore steps that must be taken before installing or upgrading an OS.

- Explore methods of producing robust reproducible OS installations.

- Explore installation types and techniques.

Installing an Operating System

- Hardware Requirements
  - Before you attempt to install an OS on a machine, it would be wise to ensure that the OS in question runs on the hardware that you have available.
- Multi-platform OS Support
  - Most OS vendors that distribute software that runs on multiple hardware architectures publish a hardware compatibility list (HCL) for their OS.
- Single Platform OS Support
  - Vendors of single-architecture OS deal with many of the same problems faced by multi-platform vendors.

Installing an Operating System

- OS for Intel-based Systems
  - Windows is probably the most widely used OS available for Intel-based systems.
    - Windows includes drivers for a wide range of devices that work on Intel-based systems.
    - Versions of Windows produced over the past decade will operate on systems ranging from a 486 chip up to the latest Pentium.
    - The current versions of Windows generally require a Pentium 166 (or better) processor chip, a minimum of 32 megabytes of memory, and 2 gigabytes (or more) of free disk space.
    - Windows may not operate smoothly on some of the older systems, but it will operate.

Installing an Operating System

- OS for Intel-based Systems
  - Recent releases of Linux are beginning to nip at the heels of Windows in regard to device driver availability, and the number of systems running the OS.
    - The open-source movement has the advantage of allowing anyone to submit a device driver for their favorite device.
  - Because there are so many PC systems available, many people know how to write "bad" software for the PC architecture.
    - This plethora of untested/unsupported software available for the system can lead to security and reliability problems.
    - Both Linux, and Windows suffer because of this situation!

Installing an Operating System

- OS for Intel-based Systems
  - Well behind Windows and Linux, BSD, and Solaris are also available for Intel architecture systems.
    - Solaris suffers from a lack of device drivers for the latest/greatest devices.
    - Solaris also often does not offer device drivers for very old devices.
    - Sun discontinued support for the Solaris Intel edition with the release of Solaris 9. They now offer a Linux "solution" in place of Solaris for Intel.
    - BSD variants are generally more secure than the competitors, and offer very robust/well tested code, but they have not caught on as general purpose offerings. BSD is often found in research labs, and under the hood of network "appliances" such as firewalls.

Installing an Operating System

- OS for Non Intel-based Systems
- Proprietary hardware architectures may not allow you to run more than one OS.
  - The "single offering" case greatly simplifies the decision regarding which OS you should load on the machine!
  - The single OS is also easier for the vendor to support, as the service personnel only have one system to learn.
  - Single-OS systems are also likely to be replaced by multi-OS systems over time.
    - **The world of computing is not a "one-size-fits-all" environment!**
    - **The UNIX vs. Windows war will be battled for many years.**

Installing an Operating System

- OS for Non Intel-based Systems
  - Whereas some architectures may only work with one OS, others are blessed with multiple fully supported OS.
    - Some vendors may provide full support for their proprietary OS but partial support for a second OS.
    - More often than not, the second OS is one of the Linux distributions.
    - Vendors such as Hewlett-Packard, IBM, Compaq and others now offer multiple OS for their hardware.
    - Other vendors (like Sun) offer a line of Intel based Linux systems, as well as the SPARC based systems.

Installing an Operating System

- OS for Non Intel-based Systems
  - Other hardware vendors only support their proprietary OS on their hardware.
    - This is true for Sun Microsystems, even though there are Linux distributions that support the SPARC architecture.
      - Although Linux is available for SPARC systems, many software vendors do not port their applications for the Linux/SPARC market.
      - Without applications available for Linux/SPARC, customers stay with the proprietary Solaris OS on Sparc.

Cataloging Hardware Requirements

- When you consider the OS hardware requirements, you need to pay close attention to any nonstandard hardware on your system.
- All hardware found on the system should be cataloged.
  - Need to determine if device drivers are available.
  - Need to determine if the hardware is mission critical.
- Looking over the inventory form before attempting to install the latest OS version may make the decision for you.

Cataloging Hardware Requirements

- PC systems typically force a few more restraints on the system hardware than other architectures.
  - For example, an Intel system requires a VGA display and keyboard in order to boot.
    - Unfortunately, there are hundreds of display adapters, thousands of keyboards, and tens of thousands of mice available for PCs of different heritage.
- OS designers also impose restraints on the system hardware.
  - Software kernel architectures may impose specific revision-level requirements on the hardware.
    - For example, Solaris 8 will not boot on the sun4c hardware architecture.

Installation Time Requirements

- When it comes to a discussion of installing an OS, the answer to "what hardware do I need?" is almost as nebulous as the answer to "how long will it take?"

- When everything goes right, a full OS install might take an hour. But when things go wrong, you might be looking at eight or more hours to get the OS installed and working.

  - How do you estimate the amount of time required for an OS installation?

Installation Time Requirements

- Never assume the OS installation will go smoothly.
- Even if you get extremely lucky, and everything does go well, figure on at least two hours just to get a bootable OS on the system media.
- Do not forget that after the OS is installed you will need to install patches and service packs to bring the OS up to date.
- Once the OS is installed and patched, do not forget that you have to install all of the applications users need in order to get their work done.
- Allow time for the appropriate number of reboots during the OS and application installation phases.
- The "load" media for an install can also have a huge impact on the installation.

Installation Methods

- Current OS are typically distributed on CD or DVD media.
- Older releases were distributed on tape cartridges or floppy diskettes.
- More often than not, the distribution media is bootable, and therefore all you have to do is place the media in the appropriate device and turn on the power.
- The magic of the boot process boots the installation media, and an installation program guides you through the installation process.

Installation Methods

- Windows Installations
  - Most Windows installations give the administrator very few options.
  - When installing from the distribution media, the administrator selects the partition to install the bits on, answers a few questions about the local environment. The system does the rest without input from the operator.
  - Unfortunately, the information required during the installation is not all collected up front; the information-gathering process is spread across the entire installation process.
    - This makes Windows installation more time consuming than it should be, as the administrator has to sit and wait for the system to ask questions.
    - If the questions were all asked up-front, the administrator would be free to attend to other tasks while the bits moved from the CD to the hard drive.

Installation Methods

- Windows CD/DVD Installations
Installation of Windows from CD/DVD media is pretty simple.
  - You boot the installation media, answer a few simple questions, and the installer program does the rest for you.
  - Unfortunately, because the process is simple, it is not very configurable.
  - The media-based installer is geared to the novice administrator's capabilities; hence, the number of decision points and allowable options is very minimal.
  - One downside to the CD/DVD installation is that the installation process is just interactive enough that the operator cannot start the installation and leave for an hour or two.

Installation Methods

- Network Installations
  - If you want to customize the installation process, and/or make it completely automatic, you need to build a network-based installation server.
    - **Such an installation is referred to as an "unattended" installation in Windows parlance.**
    - **The installation server contains on-line copies of the distribution media, a set of "answer" files that control what parts of the software get installed on the system, and a "boot daemon" that listens for installation requests on the network.**
    - **You can customize the answer files to install the OS and any required applications without operator intervention.**
    - **This is a much more suitable installation method if you have to install 100 computers instead of 2 or 3.**
  - **This method comes with a price: someone has to build (and hopefully test) the answer files.**

Installation Methods

```
; Microsoft Windows 2000 Professional, Server, Advanced Server and
   Datacenter
   ; (c) 1994 - 1999 Microsoft Corporation. All rights reserved.
   ;; Sample Unattended Setup Answer File
   ; This file contains information about how to automate the installation
   ; or upgrade of Windows 2000 Professional and Windows 2000 Server so
   the
   ; Setup program runs without requiring user input.

   [Unattended]
   Unattendmode = FullUnattended
   OemPreinstall = NO
   TargetPath = WINNT
   Filesystem = LeaveAlone

   [UserData]
   FullName = "Your Name Here"
   OrgName = "Your Organization Name"
   ComputerName = "COMPUTER_NAME"
```

Installation Methods

```
[GuiUnattended]
; Sets the Timezone to the Pacific Northwest
; Sets the Admin Password to NULL
; Turn AutoLogon ON and login once
TimeZone = "004"
AdminPassword = *
AutoLogon = Yes
AutoLogonCount = 1

;For Server installs
[LicenseFilePrintData]
AutoMode = "PerServer"
AutoUsers = "5"

[GuiRunOnce]
; List the programs that you want to launch when the machine is logged into
for the first time
```

Installation Methods

```
[Display]
BitsPerPel = 8
XResolution = 800
YResolution = 600
VRefresh = 70

[Networking]
; When set to YES, setup will install default networking
components.
 ; The components to be set up are TCP/IP, File and Print Sharing,
and
 ; the Client for Microsoft Networks.
InstallDefaultComponents = YES

[Identification]
JoinWorkgroup = Workgroup
```

Installation Methods

- **UNIX Installations**
  - Many flavors of UNIX allow (in fact, insist on) significant operator interaction during the installation process.
  - UNIX installers are often much more willing to allow custom installations than their Windows counterparts.
    - This generally infers that the operator needs to be more knowledgeable about the specifics of the system to successfully complete the installation process.
    - It also means that unattended installations are not feasible without plenty of advance configuration and planning.

Installation Methods

- CD/DVD Installations
  - As with Windows distribution media based installations, the installers used by UNIX OS are somewhat automated.
    - A difference between UNIX and Windows installers is that MOST UNIX installers ask all of the questions up-front, then use the answers to drive the remainder of the install.
      - **A typical Solaris 8 installation requires about 20 minutes of operator interaction, then for the next hour (or more) no interaction is required.**
      - **RedHat Linux installations are similar to Solaris in regards to operator interaction.**
  - While MOST UNIX installations often take care of the interactive portion up-front, a few of the installers "hold the user's hand" throughout the installation process (much like Windows).

Installation Methods

- Network Installations
  - Most versions of UNIX support a network-based installation system of one form or another.
    - Like Windows, these installers require a network-based boot server, rules files that dictate how the installation is performed, and a boot daemon that runs on the server to manage the process.
      - **The Solaris JumpStart package is one such network-based installer.**
      - **Sun's WebStart and the Linux KickStart service are other examples of the automated network-based installer.**
      - **Because there is no official standard for these network-based tools, and each vendor has one (or more) of these installers, describing all of the current offerings is difficult, if not impossible.**

Installation Methods

- Linux Kickstart
  - Linux may be "kickstarted" from a bootable floppy diskette or from a network-based boot server.
    - The floppy diskette must contain a configuration file named *ks.cfg*.
      - This file is the Linux equivalent of the Windows "answer file" for an unattended installation.
    - To perform a network installation, you need to have a DHCP server running on your network.
    - The DHCP server instructs the new system how to contact the boot service machine identified in the ks.cfg file.

Installation Methods

- The Kickstart process requires a "rules" file to control the installation.
    - The *ks.cfg* file contains several directives that tell the installer how, and what, to install on the system.
    - The format of the *ks.cfg* file is as follows.
      ```
      <command section>
      <a list of %pre, %post, and/or %packages directives>
      <installclass>
      ```
- The easiest way to create a Kickstart file is to use the *Kickstart configurator* utility supplied on the distribution media.
- To start a Kickstart install, you use a special boot floppy.
    - The boot floppy may contain a CD-ROM or network "boot block." In either case, you start the boot with the following command.
      Boot: linux ks=floppy   # ks.cfg resides on the floppy
                                               # ks.cfg resides on NFS fileserver
    - Boot: linux ks=nfs:<server_name:>/path_to_ks.cfg

Installation Methods

- Solaris Network Boot Service Daemon
  - To provide a Solaris installation server, you must build and configure a system that will listen for install requests, and know how to deliver the proper files to the host being installed.
    - This requires the sysadmin to complete the following two major tasks.
      - Build a server, install the boot server software, and configuration files.
      - Install the binaries to be served on the boot server.

Installation Methods

- Saving Critical Data
In the event your installation involves the upgrade from an old version of an OS to a new version, there is another critical point to consider.
  - What do you do with all of the old files on the system when you get ready to install the new software?
    - If the system is a standalone desktop, and you have a new OS (as well as new applications to install), you may not need to worry about saving anything from the old system.
    - More often than not, however, before an old OS is shut down for the last time there are several files you may wish to save.
- **You are strongly advised to make a full backup of every file on the system.**

Installation Methods

- Servers often present an even bigger challenge when you are upgrading an OS.
  - For instance, because you may not have to change the partitioning to load a new OS, it would help to know how the disks on the system are currently partitioned.
  - Printing out information regarding current disk partitions may be very helpful information during the upgrade.
  - Saving the password file, NIS name, server maps, user files, and other critical information before you begin the installation procedure is always strongly recommended.
  - Again, err on the side of caution, and perform a full file system backup before you begin the upgrade. Nine out of ten times you will be glad you spent the extra time to do so.