
Chapter 2: Managing Hardware Devices

Objectives

- Understand the importance of managing hardware
- Understand the purpose of device drivers
- Configure hardware resource settings and resolve resource setting conflicts
- Configure driver signing options
- Optimize server processor and memory usage
- Create and configure hardware profiles
- Configure server power options
Introduction to Managing Hardware

- Managing and maintaining hardware is a primary responsibility of a network administrator
- A wide variety of internal and external hardware components available
- Key concepts to be discussed
  - Hardware compatibility
  - Device drivers
  - Device Manager

Hardware Compatibility

- Server hardware must meet minimum system requirements for Windows Server 2003
- Microsoft maintains information about compatible hardware
  - Previous Windows versions: Hardware Compatibility List
  - Windows Server 2003: Windows Server Catalog
Understanding Device Drivers

- A **device driver** is a software interface between an operating system and a hardware device
- Generally want to use the specific recommended driver for a device
  - Affects stability and performance
- Driver updates are frequent and usually available from manufacturer
- **Driver signing** is used to verify that a driver has been tested

Device Manager

- Primary tool for managing device drivers
- Allows administrator to view and modify hardware device properties
- Should be used soon after Windows Server 2003 installation to verify device detection and functioning
- Accessible from Control Panel or Computer Management tool
Accessing Device Manager

- Control Panel → System → Hardware Tab
- Computer Management → System Tools → Device Manager

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Device Manager (continued)

- Displays non-functioning devices
  - Yellow exclamation point
- Displays manually disabled devices
  - Red x
- Allows you to update drivers
  - Download driver and install through Device Manager
  - Use Hardware Update Wizard
Adding New Devices

- Two main categories of devices
  - Plug and Play
  - Legacy
- Plug and Play devices typically installed and configured automatically
- Legacy devices typically configured manually

Plug and Play Devices

- Windows Server 2003 is Plug and Play compliant
- New hardware is usually Plug and Play
- Installed devices detected automatically
- Detected devices configured automatically
  - May need to locate or update device driver
Legacy Devices

- Many older devices not Plug and Play
- Industry Standard Architecture (ISA) bus devices not Plug and Play
- May or may not be detected by Windows Server 2003
- Typically must be configured manually
- Add Hardware Wizard used to install and/or configure

Hardware Resource Settings

- Four main types of resources
  - Direct Memory Access (DMA) channels
  - Input/Output (I/O) ranges
  - Memory address ranges
  - Interrupt request (IRQ) lines
- Resource settings configured from Resources tab of properties of hardware device in Device Manager
Hardware Resource Settings (continued)

- Manually configured resource settings may have conflicts
- Resource conflicts can cause device malfunction
- Conflicts determined using Device Manager
  - Resources tab for a device

Direct Memory Access Channels

- Allow hardware devices to access system memory (RAM) directly
- Information transfer bypasses CPU
- Common devices
  - Hard and floppy disk controllers
  - Sound cards
  - CD-ROM drives
- DMA channel used by a device can be determined from Device Manager
Input/Output Ranges

- Small dedicated memory areas
- Allocated specifically for data transfer between computer and hardware device
- Type of device dictates size of memory area
- I/O ports can be determined from Device Manager

Interrupt Request Lines

- Used to gain attention of the system processor to handle some event
- Traditionally, each device had dedicated line
- Trend is toward sharing lines, Windows Server 2003 supports sharing among some Plug and Play devices
- IRQ lines can be viewed and managed from Device Manager
Memory Addresses

- Used for communication between a hardware device and the operating system
- Devices configured with dedicated, unique memory address ranges
- Windows Server 2003 will automatically allocate memory addresses for Plug and Play devices
- For legacy devices, address ranges usually specified in documentation

Troubleshooting Resource Setting Conflicts

- Manual configuration of devices can lead to resource conflicts (overlaps and duplication of assignments)
- Two methods for checking for resource conflicts
  - Resources tab in properties of device using Device Manager
  - System Information tool
    - To open, type msinfo32.exe in Run command
    - Or
    - Start / All Programs / Accessories / System Tools / System Information
Configuring Device Driver Signing

- Every built-in driver in Windows Server 2003 is digitally signed by Microsoft
- Signing ensures compatibility, quality, authenticity, verified to work with hardware
- Three possible driver signing verification options
  - Ignore: install any driver whether signed or not
  - Warn: show warning if attempt is made to install unsigned driver
  - Block: don’t allow installation of unsigned driver

Roll Back Driver Feature

- Common for vendors to release new or updated drivers for hardware devices
  - Fix known issues, take advantage of updated features
  - Driver updates sometimes result in system stability problems
  - When update causes problems, roll back allows going back to a previous version
Configuring Processor and Memory Settings

- Three basic areas to configure for optimal performance
  - Processor scheduling and memory usage
  - Virtual memory
  - Memory for network performance

Processor Scheduling

- Allows you to configure how processor resources are allocated to programs
- Default is Background services (all running applications receive equal processor time)
- Can set to Programs (foreground application receives priority processor time)
Processor Scheduling (continued)

- Memory usage options used to configure amount of system memory allocated to executing programs versus other server functions
- Default is System cache option
  - Computer is acting as network server
  - Running programs that require considerable memory
- Programs option
  - Computer is acting as workstation
  - Running programs at console

Virtual Memory

- Disk storage used to expand RAM capacity
- Slower than RAM
- Uses **paging** technique
  - Blocks (pages) of information moved from RAM to virtual memory on disk
  - Paged out when not in use, reloaded into RAM when needed
Virtual Memory (continued)

- Area allocated is called **paging file**
- Default amount allocated when operating system installed but should be tuned by administrator
  - Microsoft recommends that the total size of the page file be 1.5 times the amount of physical RAM.
- Name of paging file is pagefile.sys
- Location of paging file important
- Two important parameters: initial and maximum size

Memory for Network Performance

- Memory is used both server functions and network connectivity functions
- Server functions use memory and paging
- Network connectivity uses only memory
- If performance is poor, may need to tune network memory parameters
Configuring Server Memory for Network Optimization

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimize memory used</td>
<td>Optimizes the memory used on servers with 10 or fewer simultaneous network users</td>
</tr>
<tr>
<td>Balance</td>
<td>Optimizes memory use for a small LAN with about 64 or fewer users</td>
</tr>
<tr>
<td>Maximize data throughput for file sharing</td>
<td>Used for a large network with over 64 users where file and print serving resources need more memory allocation to make the server efficient</td>
</tr>
<tr>
<td>Maximize data throughput for network applications</td>
<td>Used in servers that primarily handle network connections and to reduce paging activity when this affects server performance, such as on a server that mainly authenticates users to the network or that handles databases that distribute functions to the client (in client/server systems)</td>
</tr>
<tr>
<td>Make browser broadcasts to LAN manager 2 x clients</td>
<td>Used for networks that have both Windows Server 2003 and the Microsoft (and IBM) early server operating system, LAN Manager</td>
</tr>
</tbody>
</table>

These settings are available from File and Printer Sharing Properties (Properties of Local Area Connections)

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Hardware Profiles

- Set of instructions defining which devices to start and drivers to load when computer starts
- Profile 1 created when Windows Server 2003 installed, every device enabled
- Portable computers change set of hardware device available at different times
- Can create additional profiles to match situation
Configuring Power Options

- Default power scheme is Always On (monitor off after 20 minutes, hard disks never off)
  - Can select other predefined schemes or create custom scheme
- Standby mode
  - Components shut down and memory is not written to disk (if power goes out, memory information is lost)
  - Power supply and CPU remain active

Configuring Power Options (continued)

- Hibernate mode
  - Memory contents saved before shutting down disks
  - Can restart with previous applications running
- Uninterruptible power supply (UPS)
  - Battery backup device
  - Best fault-tolerance method to prevent damage with power loss
  - Can only sustain power for a limited time
Summary

• Device drivers
  • Driver signing
  • Driver roll back
• Device Manager tool
  • Primary tool for device management
• Plug and play versus legacy devices
  • Installation and configuration

Summary (continued)

• Hardware Resource Settings
  • Direct Memory Access (DMA) channels
  • Input/Output (I/O) ranges
  • Memory address ranges
  • Interrupt request (IRQ) lines
• Processor Scheduling and Memory Usage
  • Virtual memory
  • Network memory
• Hardware Profiles
• Power Options